Multiple Determinants of Project Success and Failure

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This paper presents initial findings of a study designed to detail the relationships among situational, structural, and process variables as they relate to project effectiveness. In the paper, emphasis is placed on delineating those variables which tend to improve and those which tend to impede project effectiveness.

This study is based upon a comprehensive research effort conducted by the School of Management, Boston College, and sponsored by the National Aeronautics and Space Administration.

I.   Introduction

This paper describes a study believed to be the largest and most comprehensive investigation to date on the subject of project management effectiveness. It will briefly describe 1) the sources and methods used to collect the data, 2) selected results of analysis indicating factors affecting success and those affecting failure, and 3) conclusions regarding suggestions for improving project performance.

II.   Methods

A sample of 646 responses represented a variety of industries (34% manufacturing, 22% construction, 17% government, and 27% services, transportation and others). Most of the respondents themselves had been directly involved in the particular project they chose to describe in their questionnaire. Of the total sample, 50% had been the project manager, 31% had been in other positions on the project team, and another 10% had been the project manager's direct superior. About one-third of the projects were described

as being public in nature, the remaining two-thirds being in the private sector.

The types of contracts or agreements involved included cost plus fixed fee

(32%) in-house work orders (28%), fixed price (21%), and fixed price with incen-

tives (14%). The major activity or end product involved in the projects included

construction (43%), hardware or equipment (22%), new processes or software (14%),

and studies, services and tests (11%).

The purpose of this analysis was 1) to determine those factors which affect

project performance, and 2) to distinguish between those factors which improve

success and those which cause failure. To achieve this purpose, the data were

analyzed in two ways.

> First, product-moment correlations were performed on the project
> characteristics with six success items. See Exhibit 1. These
> correlations would indicate linear relationships of the project
> characteristics with the success items. It was found that the
> overall subjective item--"All things considered, the project was
> a success"--presented a fair overall measure of success. This
> is shown by the very strong correlations of this item with the others:

> | | |
> |---|---|
> | satisfaction - parent | $r \geq .654$ |
> | satisfaction - client | $r \geq .611$ |
> | satisfaction - user | $r \geq .518$ |
> | satisfaction - project team | $r \geq .646$ |
> | technical performance | $r \geq .559$ |

> Therefore, for the purposes of this paper it was felt that the
> single overall subjective measure would be an adequate index of
> success.

> Second, F-Test analysis of variance was performed on the project
> characteristics with success items categorized by degree. This
> analysis allows the identification of non-linear relationships--
> particularly association with either success or failure.
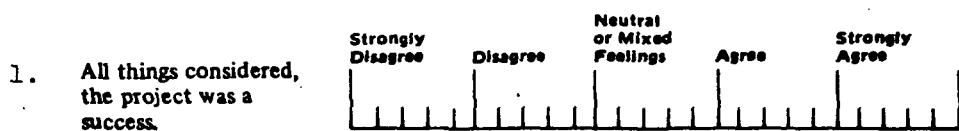
III. Results

A. Project Management Characteristics Associated with Failure

Considering the above, it was found that the presence of certain project

management characteristics strongly affects the perceived failure of projects.

The absence of these characteristics, however, does not insure perceived success.
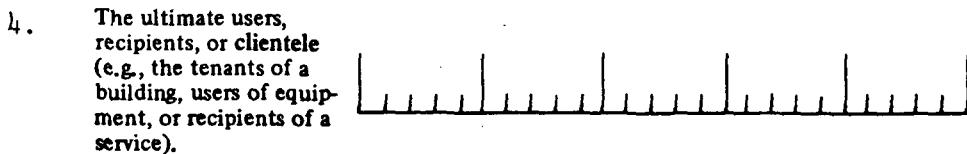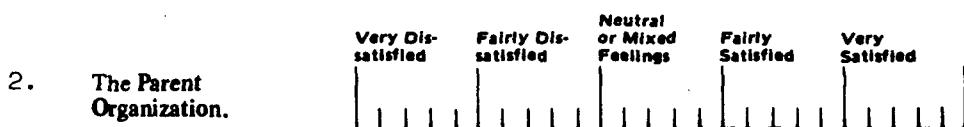
EXHIBIT 1.   SIX ITEMS USED TO MEASURE SUCCESS

How much do you agree or disagree with each of the following statements?

1.   All things considered, the project was a success.

Strongly Disagree	Disagree	Neutral or Mixed Feelings	Agree	Strongly Agree

• • •

In general, how satisfied were the following groups with the outcome of the project?

Very Dissatisfied	Fairly Dissatisfied	Neutral or Mixed Feelings	Fairly Satisfied	Very Satisfied

2.   The Parent Organization.

3.   The Client Organization.

4.   The ultimate users, recipients, or clientele (e.g., the tenants of a building, users of equipment, or recipients of a service).

5.   The Project Team.

• • •

6.   Did the end result of the project adequately fulfill the technical performance mission or function to be performed?

Very Inadequately	Fairly Inadequately		Fairly Adequately	Very Adequately

The characteristics affecting perceived failure are shown on Exhibit 2.

B. Project Management Characteristics Associated with Success.

While the items shown on Exhibit 2 were found to be associated with perceived project failure, certain other project management characteristics were found to be associated with perceived success. These are shown on Exhibit 3. The characteristics listed were found to be necessary, but not sufficient conditions, to guarantee perceived success.

C. Project Management Characteristics Linearly Related to Both Success and Failure.

In addition to the characteristics which affect perceived success or failure, some were found to be linearly related to both perceived success and perceived failure. That is, the presence of these characteristics tends to improve perceived success while their absence contributes to perceived failure. The characteristics linearly related to both perceived success and perceived failure are shown on Exhibit 4.

D. Project Management Characteristics Associated with Schedule and Cost Overruns.

An unexpected and counter-intuitive finding of this study was that cost and schedule performance was not a primary determinant of overall perceived success. If the study had been conducted solely upon aerospace projects, this might not have been too surprising, but aerospace projects represented less than 20% of the responses. For project managers and project personnel who have constantly lived with heavy emphasis upon meeting schedules and staying within budgets, this finding may be difficult to swallow. A partial explanation may be as follows: The survey was concerned only with completed projects. As perspective is developed upon a project, the ultimate satisfaction of the parent, the client, the ultimate users, and the project team is most closely related to whether the project end-item is performing as desired. A schedule delay and a budget overrun may seem

EXHIBIT 2   PROJECT MANAGEMENT CHARACTERISTICS WHICH STRONGLY AFFECT THE PERCEIVED FAILURE OF PROJECTS(The absence of these characteristics does not insure perceived sucess).

. Insufficient use of status/progress reports

. Use of superficial status/progress reports

. Inadequate project manager administrative skills

. Inadequate project manager human skills

. Inadequate project manager technical skills

. Insufficent project manager influence

. Insufficient project manager authority

. Insufficient client influence

. Poor coordination with client

. Lack of rapport with client

. Client disinterest in budget criteria

. Lack of project team participation in decision-making

. Lack of project team participation in major problem solving

. Excessive structuring within the project team

. Job insecurity within the project team

. Lack of team spirit and sense of mission within project team

. Parent organization stable, non-dynamic, lacking strategic change

. Poor coordination with parent organization

. Lack of rapport with parent organization

. Poor relations within the parent organization

. New "type" of project

. Project more complex than the parent has completed previously

. Initial under-funding

. Inability to freeze design early

. Inability to close-out the effort

. Unrealistic project schedules

. Inadequate change procedures

. Poor relations with public officials

. Unfavorable public opinion

EXHIBIT 3.: PROJECT MANAGEMENT CHARACTERISTICS ASSOCIATED WITH PERCEIVED SUCESS. (The following were found to be necessary, but not sufficient conditions for perceived success).

- Frequent feedback from the parent organization

- Frequent feedback from the client

- Judicious use of networking techniques

- Availability of back-up strategies

- Organization structure suited to the project team

- Adequate control procedures, especially for dealing with changes

- Project team participation in setting schedules and budgets

- Flexible parent organization

- Parent commitment to established schedules

- Parent enthusiasm

- Parent commitment to established budget

- Parent commitment to technical performance goals

- Parent desire to build-up internal capabilities

- Project manager commitment to established schedules

- Project manager commitment to established budget

- Project manager commitment to technical performance goals

- Client commitment to established schedules

- Client commitment to established budget

- Client commitment to technical performance goals

- Enthusiastic public support

- Lack of legal encumbrances

- Lack of excessive government red tape

- Minimized number of public/government agencies involved

EXHIBIT 4: PROJECT MANAGEMENT CHARACTERISTICS LINEARLY RELATED TO BOTH PERCEIVED SUCCESS AND PERCEIVED FAILURE. (The presence of these characteristics tends to improve perceived success while their absence contributes to perceived failure).

. Goal commitment of project team

. Accurate initial cost estimates

. Adequate project team capability

. Adequate funding to completion

. Adequate planning and control techniques

. Minimal start-up difficulties

. Task (vs. social) orientation

. Absence of bureaucracy

. On-site project manager

. Clearly established success criteria

somewhat unimportant as time goes on, in the face of a high degree of satisfaction and a sound foundation for future relationships. Conversely, few can legitimately claim that "the operation was a success but the patient died." If the survey had been conducted for current, ongoing projects only, the management emphasis upon meeting schedules and staying within budgets probably would have been reflected much more heavily in the survey results.

In order to shed greater light upon this counter-intuitive finding, it was decided to further investigate those project management characteristics which directly affected cost and schedule overruns. Although cost overruns were highly correlated with the size of the project and the difficulty of meeting technical specifications, it was noted that schedule difficulties represented the primary causal factors. The characteristics causing schedule overruns and attendant cost overruns are shown on Exhibit 5.

E. Project Management Factors Non-Linearly Related to Failure.

In order to simplify the data and to enhance the understanding of the project characteristics, a factor analysis was performed on the variables describing each project. While the correlations allow us to study the relationships of specific items or project characteristics, factor analysis allows us to move a step closer toward understanding the total pattern of relationships among all of the variables. Factor analysis is a statistical technique which can analyze the relationships between any number of variables and produce a set of "factors" or underlying dimensions--each representing an interrelated "cluster" of the original variables. Thus when, say, five variables tend to "travel together" they are "boiled down" to a single factor for analysis purposes. This has the important advantage of reducing the number of variables to be studied.

One of the factors which emerged in the factor analysis provided us with a measure of project success. This factor, which we called "Perceived Success of the Project," was comprised of the following individual questionnaire items:

EXHIBIT 5: PROJECT MANAGEMENT CHARACTERISTICS WHICH DIRECTLY AFFECT COST AND SCHEDULE OVERRUNS. (Although cost overruns were highly correlated with the size of the project and the difficulty of meeting technical specifications, it was noted that schedule difficulties were the primary causal factors. It was found that schedule overruns were caused by the characteristics listed below).

. Cost underestimates

. Use of "buy-in" strategies

. Lack of alternative back-up strategies

. Lack of project team goal commitment

. Functional rather than projectized, project organization

. Lack of project team participation in setting schedules

. Lack of team spirit, sense of mission

. Inadequate control procedures

. Insufficient use of networking techniques

. Insufficent use of progress/status reports

. Overoptimistic status reports

. Decision delays

. Inadequate change procedures

. Insufficient project manager authority and influence

. Lack of over all commitment to budget and schedule

. Overall lack of similar experience

Item	Factor Loading
Satisfaction with outcome - client	.734
Satisfaction with outcome - parent	.701
Satisfaction with outcome - project team	.683
Project was a success	.678
Satisfaction with outcome - end users	.670
Technical adequacy of end result	.588

A total of thirty-three other identifiable and distinct factors were derived from the variables. In order to identify any non-linear relationships among the factors and perceived success or failure, an F-test analysis of variance was performed on the factors with success items categorized by degree. Exhibit 6 shows the factors in order of importance, which strongly affect the perceived failure of projects, using F-test analyses of variance. Again, the absence of these characteristics does not insure perceived success.

IV. Conclusions

The analysis of the data indicates that some factors determine success, some affect only failure, and others are linearly related. More important, however, is the implication that there is no magic list of a few items which will insure the success of a project. Many factors contribute to project success.

Management, especially project management, is a fragile mechanism with many interactive parts. Each of these parts must be carefully planned, designed, built, tested, and maintained. There are many variations of the mechanism that will work well. But there are also many wrenches that can be thrown into the works and destroy the mechanism.

The results of this study suggest a set of strategy guidelines for project management. Exhibit 7 presents a set of strategy guidelines for the client organization, the parent organization, and the project team for three distinct phases of a project. It is important to note 1) the interlocking and interdependent relationships among the three organizational groups involved, and 2) that two of the three phases leading to overall project success occur before contract award.

EXHIBIT 6 : PROJECT MANAGEMENT FACTORS NON-LINEARLY RELATED TO PERCEIVED FAILURE OF PROJECTS, USING F-TEST ANALYSES OF VARIANCE. (The absence of these factors does not insure perceived success. The factors are in order of importance).

- Absence of project management planning and control techniques

- Poor client relations

- Poor coordination in general

- Inherent project complexity

- Absence of project team participation

- Insufficient project manager authority and influence

- Ill defined success criteria

- Legal-political externalities

- Buy-in strategy

- Poor public relations

- Static or undynamic parent organization

- Initial start-up difficulties

- Excessive bureaucracy

- Rigid parent organization

EXHIBIT 7. STRATEGY GUIDELINES FOR MORE SUCCESSFUL PROJECTS BASED UPON SIGNIFICANT RELATIONSHIPS FOUND IN SEVERAL HUNDRED PROJECTS.

	Conceptual Phase (Before the Invitations for Bid)	Bid, Proposal, Contract Definition, and Negotiation Phase (Before Contract Award or go-ahead)	Implementation Phase (After Contract Award or go-ahead)
The Client Organization and/or Principal Client Contact	Encourage openness and honesty from the start from all participants. Create an atmosphere that encourages healthy, but not cutthroat, competition or "liars' contests." Plan for adequate funding to complete the entire project. Develop clear understandings of the relative importance of cost, schedule, and technical performance goals. Seek to minimize public participation and involvement. Develop short and informal lines of communication and flat organizational structures. Delegate sufficient authority to the principal client contact and let him promptly approve or reject important project decisions.	Reject "buy-ins." Make prompt decisions regarding contract award or go-ahead.	Develop close, but not meddling, working relationships with project participants. Avoid arms-length relationships. Do not insist upon excessive reporting schemes. Make prompt decisions regarding changes.
The Parent Organization and/or Principal Parent Contact	Select, at an early point, a project manager with a proven track record of technical skills, human skills, and administrative skills (in that order) to lead the project team. Develop clear and workable guidelines for your project manager. Delegate sufficient authority to your project manager and let him make important decisions in conjunction with his key project team members. Demonstrate enthusiasm for and commitment to the project and the project team. Develop and maintain short and informal lines of communication with the project manager.	Do not exert excessive pressure on the project manager to win the contract. Do not slash or balloon the project team's cost estimates. Avoid "buy-ins." Develop close, but not meddling, working relationships with the principal client contact and the project manager.	
The Project Manager and/or the Project Team	Insist upon the right to select your own key project team members Select key project team members with proven track records in their area of expertise. Develop commitment and a sense of mission from the outset among project team members. Seek sufficient authority and a projectized form of organizational structure. Coordinate frequently and constantly reinforce good relationships with the client, the parent, and your team. Seek to enhance the public's image of the project.	Call upon key project team members to assist in decision-making and problem solving. Develop realistic cost, schedule, and technical performance estimates and goals. Develop back-up strategies and systems in anticipation of potential problems. Develop an appropriate, yet flexible and flat, project team organization structure. Seek to maximize your influence over people and key decisions even though your formal authority may not be sufficient.	Employ a workable and candid set of project planning and control tools. Avoid pre-occupation with, or over-reliance upon, one type of project control tool. Constantly stress the importance of meeting cost, schedule and technical performance goals. Generally, give highest priority to achieving the technical performance mission or function to be performed by the project end-item. Keep changes under control. Seek to find ways of assuring the job security of effective project team members. Plan for an orderly phase-out of the project